

Abstract of the Disclosure

A high data-rate electron beam spot-grid array imaging system is provided that overcomes the low resolution and severe linearity requirements of prior art systems. Embodiments include an imaging system comprising an electron beam generator for simultaneously irradiating an array of spots spaced apart from each other on a surface of an object to be imaged, and a detector for collecting backscattered and/or secondary electrons emitted as a result of the interaction of the spots with the surface of the object to form an image of the irradiated portions of the object surface. A mechanical system moves the substrate in a direction which is nearly parallel to an axis of the array of spots such that as the substrate is moved across the spot array in the scan direction (the y-direction) the spots trace a path which leaves no gaps in the mechanical cross-scan direction (the x-direction). A compensator, such as a servo or a movable mirror, compensates for mechanical inaccuracies in the moving stage, thereby increasing imaging accuracy. In other embodiments, multiple detectors placed at different angles to the substrate collect electrons to provide multiple perspective imaging of the substrate surface.